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University of Cambridge
School of Agriculture Memoirs

Memoir No. 7

A brief summary of the papers published by
the Staffs of the School of Agriculture and
its Associated Research Institutes during
the period May 1st, 1934—Sept. 30th, 1935.



1935

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FOREWORD

This Memoir, which is published under the general editorship of the Librarian of the School, represents an attempt to present as succinctly as possible the contributions made by members of the Staffs of the School of Agriculture and its Associated Institutes to the development and progress of Agricultural Science, to indicate to research workers interested the Journals in which the full papers are presented and to act as a complete record of papers published. Each summary is compiled by the author of the paper and is presented, so far as the subject matter will allow, in a non-technical form in order to be of value to the general body of farmers interested in the more recent developments of agricultural scientific research in general and of the activities of this Department in particular.

Requests for further information or criticism arising out of the summaries should be referred to the individual author concerned, criticisms and suggestions for the improvement of the Memoir itself should be addressed to the Librarian of the School.

E. T. H.

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[illegible]

Members of Staffs, summaries of whose papers are included in these
Memoirs.

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University of Cambridge

School of Agriculture Memoirs

THE SCHOOL OF AGRICULTURE INCLUDING ESTATE MANAGEMENT, THE ADVISORY SERVICES AND ASSOCIATED RESEARCH INSTITUTES

Agricultural Education in Cambridge dates from 1892 when the Cambridge and Counties Agricultural Education Committee, an informal body consisting of University Professors and County Council representatives, first organised an Agricultural Course. In 1899 the University created a Department of Agriculture to take over the work of this Committee. The School of Agriculture was built by public subscription in 1909 and expanded by a grant from the Development Commission in 1912. The rapid expansion of the Animal Nutrition Institute and the Plant Breeding Institute under the direction of Professor T. B. Wood and Professor R. H. Biffen led to increased demands on accommodation, and an extension to the building was made in 1925–26 by the aid of a further grant from the Development Commission. The Estate Management Branch has been added since the war for the purpose of providing technical and professional assistance in the management of University and College property and with a view to affording opportunities for practical demonstrations in connection with the teaching of Estate Management subjects.

The Rockefeller Benefaction, made to the University in 1929, provided money for additional accommodation for the Department of Agriculture and for an expansion of its activities, and a new building was completed and occupied in March, 1933.

The Department of Agriculture is primarily a teaching department of the University, but research in the problems of agriculture and cognate sciences is carried out by members of the teaching staff and by members of the staffs of the Research Institutes attached to the Department. Additional facilities for both teaching and research are provided by the University Farm which occupies an area of some 700 acres within reasonable distance of the scientific laboratories.

*Reprints available for free distribution. Please quote marginal number instead of full title. Enquiries for papers not starred should be sent to the author.

AGRICULTURE.

AMOS, A. and WOODMAN, H. E.

"Ensilage." 3rd ed.

Bull. No. 37. Minist. Agric. and Fish. 1934. (Obtainable from H.M.S.O., London. Price 1s.).

EDE, R.

"Research Work at the School of Agriculture."

C.U. Agric. Soc. Mag. 1935, 4 (No. 3), 5

ENGLEDOW, F. L.

"The Problem of Cereal Yield."

Proc. World's Grain Exhib. and Conf., Regina. 1933, 2, 9

The problem of cereal yield merits continued study despite the present over-production of cereals throughout the world. Its practical aspects are discussed and from these, inferences are drawn as to the lines desirable for an investigational attack. It is suggested that both external and internal factors of yield should be studied simultaneously, the basis of the work being varietal comparison under different control conditions.

383* GARNER, F. H.

"Preparing for the London Dairy Show."

Dairy Short. J. 1935, 4, 65 ; 285

A brief account is given of the feeding and management of cows in preparation for the milking trials at the London Dairy Show.

357* GARNER, F. H., GRANTHAM, J. and SANDERS, H. G.

"An Electric Oven for Drying Samples from Field Plots."

J. Agric. Sci. 1935, 25, 315

A thermostatically controlled electric oven is described and evidence is produced that the uniformity of drying in it is satisfactory.

356* GARNER, F. H. and SANDERS, H. G.

"Investigations in Crop Husbandry. 11. On the Age of Seed Beans."

J. Agric. Sci. 1935, 25, 361

This paper describes field scale experiments carried out over a period of three years, with two strains, to compare old and new beans for seed. In general new seed gave higher yields than old seed, but the difference was only of the order of 10 per cent. There was some evidence that conditions when the seed was harvested might be more important than age.

GARNER, F. H. and SANDERS, H. G.

"New or Old Seed for Autumn-sown Field Beans."

J. Minist. Agric. 1935, **42**, 521

A summary of the paper appearing in the *Journal of Agricultural Science* in July, 1935.

HANLEY, F.

"The Agricultural Education Exhibit at the Royal Show, Ipswich, 1934."

Agric. Prog. 1935, **12**, 180

MACGREGOR, J. J.

"Dartington Hall and some of its Implications."

C.U. Agric. Soc. Mag. 1935, **4** (No. 3), 36

MANSFIELD, W. S.

"Quality with Quantity."

Fmr and Stk-Breed. 1935, **49**, 2054

A brief description of the methods employed in growing a certain 17 acre field of Yeoman Wheat on the Cambridge University Farm in 1935. This wheat when milled won for the millers', Messrs Nutter and Sons of Fulbourn, from two hundred competitors, the Miller Cup at the Bakers' Exhibition. This cup is given for the best sample of bread made from exclusively English-grown wheat.

MANSFIELD, W. S.

"The University Farm, 1933-1934."

C.U. Agric. Soc. Mag. 1934, **4** (No. 2), 9 : 1935, **4** (No. 3), 14

SANDERS, H. G.

"Animalisation of British Agriculture."

C.U. Agric. Soc. Mag. 1934, **4** (No. 2), 21

WISHART, J.

"Some Impressions of Chinese Agriculture."

C.U. Agric. Soc. Mag. 1935, **4** (No. 3), 43

343* WOODMAN, H. E.

"The Artificial Drying of Young Grass."

J. Minist. Agric. 1935, **41**, 1049

The purpose of this article is to describe the progress that has been made with the proposal for conserving young grass by the method of artificial drying for use as a winter concentrate.

328* WOODMAN, H. E.

"Modern Developments of Ensilage."

J. Minist. Agric. 1934, **41**, 566

An account of recent investigations into methods of controlling the processes of fermentation that occur when a green crop is ensiled by (1) addition of a sterilizing agent (2) stimulation of the lactic fermentation, and (3) regulation of acidity (A.I.V. silage). This article has been incorporated in the 3rd edition of the Ministry of Agriculture's Bulletin No. 37.

AGRICULTURAL CHEMISTRY.

HANLEY, F.

"The Advisory Chemist's Postbag."

"Notes by the Advisory Chemist."

Husbandry. 1935, 5, 7, 42, 70

An account of the feeding and manurial values of various bye-products.

AGRICULTURAL ECONOMICS.

"An Economic Survey of Agriculture in the Eastern Counties, 1933."

Farm Econ. Branch Rept. No. 22. Pp. 83. Price 2/6 net. Postage 3d.

This report represents the third of a series (the predecessors being Reports 19 and 21) covering the results of the most extensive Farm Management Survey hitherto undertaken in Great Britain. The results are based on records obtained from over 1000 farms distributed throughout nine of the eleven main "type of farming" areas in the Eastern Counties.

The net returns obtained by farmers in 1933 were considerably better than those secured in either of the two preceding years. This more encouraging position was achieved in spite of a further fall in the price index, and well illustrates that unit prices are only one factor influencing the prosperity of the industry. These better net returns were due mainly to quantitative changes in production, brought about partly by favourable weather conditions, and partly by deliberate alterations in organisation on the part of the farmers themselves. These changes are commented on in the chapter dealing with financial and economic matters.

Chapters III and IV are devoted to a description of the organisation of certain individual farms, which over the period of three years, have been outstanding as a result of either comparatively high profits or severe losses. No two farms and no two farmers have identical capabilities or opportunities, and the contents of these chapters are not intended to provide models of what should or should not be done in any particular case. They are included here primarily to illustrate certain general tendencies which appear to underlie financial success or failure at the present time. Chapter V covers a miscellanea, including studies of (1) the influence of size of farm on crop yields per acre (2) the extent of lime deficiency in the Province (3) the age of occupiers, and their length of experience and tenancy, and (4) the number of immigrant farmers, and their place of origin.

This report, together with its two predecessors, contains a mass of data dealing with many points of interest in the financial, economic and social structure of agriculture in the Province.

"The Cambridge Farm Account Book."

Price 3/- net. Postage 6d.

This account book has been designed to meet the requirements of the majority of mixed arable farmers in the Eastern Counties. For convenience it is divided into six sections, viz, (1) Valuations, (2) Livestock Sales and Purchases, (3) Crop Sales and Miscellaneous Receipts, (4) Labour, Purchased Foods, and other expenses, (5)

Balance Sheets and Profit and Loss Account, and (6) Interpretation of the year's figures. Explanatory notes and cross references are given to simplify the accounting, while ample space is provided for recording quantities and qualities of the goods dealt with. Facilities are given for preparing cost estimates of the most important departments, and a skeleton Budget Form is outlined.

" Interpretation of Farm Accounts."

Farm Econ. Branch. Fmrs' Bull. No. 1. 3rd ed. re-written and enlarged. Price 6d. Post Free.

This pamphlet, written for farmers, outlines a method of summarising and interpreting farm accounts. It shows how certain important input-output ratios may be computed, cost estimates prepared, and a budget for the ensuing year's operations drawn up.

CARSLAW, R. MCG.

" The Milk Problem—Higher Prices or Lower Costs?"

Fmr and Stk-Breed. Dairy Suppl. 1st April, 1935, p. vii.

CARSLAW, R. MCG.

" Profitable Farms Use More Fertilisers."

Fmr and Stk-Breed. 1934, 48, 2601

359* CARSLAW, R. MCG.

" The Use of Accounts in Farm Management."

6th Int. Congr. Sci. Management. London, 1935.

For many centuries money played only a small part in the organisation of rural communities, but modern developments in agricultural production and exchange have introduced entirely new conditions. It cannot be said that farmers as a class have shown any spontaneous appreciation of the managerial value of accounts. Reasons for this are suggested. The predominant system of farming is a mixed organisation of crops and livestock. The economic characteristics of such an organisation are described, and the close association of the various departments of the farm stressed. There are two main directions in which accounts may aid management, viz, (1) in organising for the optimum selection and combination of departments, and (2) in improving the efficiency of production within individual departments. Examples are given of the application of accounts and similar records to improving farm management in the eastern arable counties of England, and emphasis is laid on the importance of " budgeting." Attention is drawn to the need for simplicity in technique, and to the dependence of farmers on the assistance of local agencies in the matter of interpretation.

CARSLAW, R. MCG. and GRAVES, P. E.

" The Farmer's Labour Bill."

Farm Econ. 1935, I, 203

The purpose of this note is to suggest that the official index numbers for wage rates in some respects exaggerate, and in others understate, the disharmony of this cost item with produce prices. In regard to the former possibility, the increased

efficiency with which labour is now applied, thanks to tractors and other labour-saving machines, has resulted in a marked raising of the physical output per unit of labour. In regard to the latter, the rising proportion of high pay workers to total employees is masked in the official indices of wage rates, while it seems probable that the shorter standard hours and the development of such crops as sugar beet has increased the amount of over-time and piece work. Investigation of the position on a large number of arable farms suggests that the cost per worker is now approximately 11 per cent. higher than weekly wage rates.

CARSLAW, R. MCG. and GRAVES, P. E.

"Forecast of the 1935 Wheat Acreage."

Farm Econ. 1935, I, 186

Estimates, based on records obtained from about 600 farmers, suggest that the total area of wheat in England and Wales in 1935 will probably show little increase on that of 1934. If the climatic conditions influencing the 1935 harvest are unfavourable the total production may actually show a substantial decrease.

346* CARSLAW, R. MCG. and GRAVES, P. E.

"Recent Changes in the Physical Output of Arable Farms."

Econ. J. 1935, 45, 106

Recent years have witnessed marked changes in the organisation of farms, and this article attempts to measure quantitatively the more important of these changes in the eastern arable counties of England during the three years 1931-33. It is estimated that during this period livestock were increasing at the rate of 8 per cent. per annum, that the area under "cash" crops increased at the rate of about 6 per cent. per annum, but that the fodder crop area decreased at the rate of about 8 per cent. per annum. Thanks largely to favourable seasons the production of cereals and "cash" roots increased more rapidly than their acreage, while the production of fodder crops (particularly hay) suffered from the dry seasons. As a result of the declining production of fodder crops and an increase in the *proportion* of cereals sold, crop produce available for livestock feeding declined by about 13 per cent. per annum, in spite of the rising livestock numbers. This decline was counter-balanced largely by greater expenditure on purchased foodstuffs, but there is also evidence of increased efficiency in the farmers' rationing methods.

CARSLAW, R. MCG. and JOLLY, A. L.

"Milk Production on Arable Farms."

Fmr and Stk-Breed. 1934, 48, 2375

CARSON, S. H.

"Changes in the Net Output of a Suffolk Farm."

Farm Econ. 1935, I, 220

The information contained in this note relates to a farm in Suffolk for which annual financial accounts are available since 1877. Throughout these 57 years labour has on the average received exactly two-thirds, and the landlord one-fifth of the Net Output, while the occupier's share has been one-seventh. During the period labour's share has increased, the landlord's share has decreased, while that obtained by the occupier has fluctuated erratically. Quantitative data are provided.

EDWARDS, J.

"Tell the Public of Milk."

Fmr and Stk-Breed. Dairy Suppl. 1st April, 1935.

A discussion of methods by which whole milk consumption might be increased to benefit both the consumer and the dairy farmer.

GRAVES, P. E.

"The Influence of Change in Size of Herd on Average Yield per Cow."

Fmr and Stk-Breed. 1935, 49, 664

An investigation of milk production on some 300 farms in the Eastern Counties for the three years 1930-33 showed that the number of cows had increased during the period by about 10 per cent., while the average yield per cow had tended to decline. When the farms were grouped according to whether the individual herd numbers had (1) remained constant, (2) increased, and (3) decreased, the following figures emerged.

Size of herd	Average yield per cow in herd.					
	1931	1932	Change	1932	1933	Change
Constant	604	602	- 2	607	609	+ 2
Increasing	681	637	- 44	647	610	- 37
Decreasing	583	588	+ 5	545	607	+ 62

It is of interest to note that the herds which were increasing in numbers had considerably higher yields per cow than those which were decreasing in numbers. No doubt the main explanation of the changes in yield is that herds decreasing in numbers are culling the poorest cows, while herds increasing in numbers are adding heifers, and perhaps not culling as heavily as they normally would.

JOLLY, A. L.

"Milk Producer-Retailers' Profits."

Farm Econ. 1934, I, 163

The profits obtained by producer-retailers are by no means as large as might be anticipated from the price advantage which they possess. A number of factors—some of them rather obscure—in production for the retail market increase costs. Delivery is one obvious item which on the average appears to amount to about $3\frac{1}{2}d.$ per gallon. Wastage is higher on producer-retailing farms than on farms selling wholesale. The need for level production in producer-retailing enhances feeding costs considerably, while depreciation of cows is also a heavier charge than on farms selling wholesale. It may be said that the main difficulty of the producer-retailer arises from the necessity of maintaining a level delivery, and it is here that he is at a disadvantage compared with the non-producer-retailer, who obtains his milk regularly from wholesalers.

MENZIES-KITCHIN, A. W.

“The Influence of Price Fluctuations on Consumer Demand.”

Farm Econ. 1934, I, 141

Statistics of the consumption and retail value of various foodstuffs in Great Britain illustrate marked changes in consumer demand in recent years, expressed either as totals or per capita. When comparison is made between these changes and the price movements during the period, it is evident that they have been largely the result of substitution by the housewife, in an attempt to get value for her money. The effect on agricultural producers of these changes in consumer demand is calculated. For example, the reduced demand since 1924–27 for beef is equivalent to nearly 400,000 10 cwt. bullocks per annum, while the increased demand for pig meat entails the production of nearly 4 million more bacon pigs. The rapid change over in the character of consumption, largely associated with price, has an important bearing on present agricultural policy.

336* MENZIES-KITCHIN, A. W.

“Some Aspects of Small Holdings in the Agricultural Structure.”

Econ. J. 1934, 44, 657

The evidence on which this study is based was collected as part of a general survey of agricultural conditions in the Eastern Counties of England in 1932, and as far as small holdings are concerned is limited to holdings between 20 and 50 acres. The paper compares certain essential differences in the organisation of small and large farms, and indicates certain lines along which small holdings in this country might profitably be developed. It is shown that compared with large farms the small farm has (a) a greater resistance to low prices, (b) produces twice the value of produce per acre, (c) provides employment for approximately twice as many men per acre, and (d) that the Social Output is increased by 80 per cent. Comparisons are made between the incomes of small holdings in certain districts, and between profitable and unprofitable holdings in the same district, and an attempt is made to analyse the reasons for these differences in income. The conclusion is reached that success of small holdings is mainly a matter of evolving a suitable organisation of the “locality,” and that it is not so dependent on soil type or retail market as is generally believed.

PETTIT, G. H. N.

“Food Recording for Dairy Cows.”

Herts Milk Rec. Soc. Rep., 1934, p. 67.

Cambs Milk Rec. Soc. Handb., 1933–34, p. 50.

Essex Farmers' J. 1935

Dairy Diary. 1935, 7 (No. 2), 7

This article outlines the scope and objective of food recording as an aid to increased efficiency in herd management.

372* VENN, J. A.

“The Financial and Economic Results of State Control in Agriculture.”

Rep. Brit. Ass. Sect. M. Agric. Norwich, 1935.

An account is given of the two periods of depression through which agriculture passed during the nineteenth century. In neither case was recovery helped to any extent by direct government action. This is in striking contrast to the depression

through which agriculture has been passing since the war. Up to 1930 assistance from the Government consisted mainly of direct subsidies and generous remissions of taxation. The financial gain to the farmer, though partly set off by the rise in labour costs due to the Wages Boards, is estimated to be £23,500,000.

Since 1931, Government assistance, through the medium of marketing boards, levies and quotas, is taking the form of economic planning, with its consequential rise in the income of the tenant farmer. The possible future trend of this policy is discussed.

AGRICULTURAL ZOOLOGY (including ENTOMOLOGY).

PETHERBRIDGE, F. R.

“Beet Sickness Present in England.”

J. Minist. Agric. 1934, **41**, 825

This is a short note recording for the first time the occurrence of beet eelworm attack on sugar beet in this country and points out that this trouble is likely to arise when sugar beet or mangolds are grown frequently on the same fields. A list of known host plants is also given, together with symptoms of an attack.

345* PETHERBRIDGE, F. R. and THOMAS, I.

“The Control of Flea Beetles in Seed-beds.”

J. Minist. Agric. 1935, **41**, 1070

Experiments have been conducted on the control of flea beetles on *Brassicae* seed-beds, using the following materials :—

1. Naphthalene, grade 16.
2. 2 per cent. and 4 per cent. nicotine dust.
3. 10 per cent. nicotine sulphate dust.
4. Heavy Derris dust.
5. Medium Derris dust (0·2 per cent. Rotenone).
6. Light Derris dust (0·2 per cent. Rotenone).
7. Hydrated lime.
8. Proprietary dust containing a large amount of lime.
9. Sulphur plus lead arsenate dust.
10. Barium fluo-silicate dust.

Of the above, the best results have been obtained with dusts 5 and 6, the medium and light Derris dusts, the latter having the advantage of being cheaper because a smaller weight per acre is required. Dusts, such as hydrated lime, are useful if applied frequently and in large quantities. Nicotine dust has given fair results, but it is much more expensive. Naphthalene is useful if applied before the plants come through the ground to prevent the early underground attack, which is sometimes very severe.

326* THOMAS, I.

“On the Bionomics and Structure of Some Dipterous Larvae Infesting Cereals and Grasses. II. *Opomyza germinationis* L.”

Ann. Appl. Biol. 1934, **21**, 519

In the laboratory the larval food plants of *Opomyza germinationis* L. are oats, wheat, barley, *Lolium perenne*, *L. italicum*, *Dactylis glomerata*, *Festuca rubra*, *Poa*

trivialis and *Cynosurus cristata*. In the field, only a few larvae were found in the cereals, the chief host plants being the grasses. The injury is similar to that caused by the larva of *Oscinella frit* L.

There are three larval instars, and pupation takes place inside the host plant near the ground. Adults emerge in mid-June and live until early November.

In the laboratory, eggs were laid in September and October either on the plants generally near the ground level or on the soil near the seedlings.

A description is given of the three larval instars, the egg and the puparium.

ANIMAL BREEDING AND GENETICS.

EDWARDS, J.

"Breeding Worth in Livestock."

Times. Sept. 30th, 1935.

EDWARDS, J.

"Fact or Fiction?"

C.U. Agric. Soc. Mag. 1934, 4 (No. 2), 53

Theories held by practical breeders to explain certain breeding phenomena are discussed in the light of recent scientific knowledge.

EDWARDS, J.

"Visit the Progeny Test at the Royal Show."

Dairy Short. J. 1934, 3, 161

EDWARDS, J.

"Telephony."

Pig Breed. Gaz. 1935, 32, 13

HAMMOND, J.

"Breeding for Bacon."

Conf. Agric. Organisers. Cambridge, 1935, p. 133.

An account of how educational efforts can assist the Pig and Bacon Marketing Schemes.

330* HAMMOND, J.

"Fertility in Poultry."

Rep. 18th Poult. Breed. Conf., Harper Adams Agric. Coll., Aug. 1934

A summary of recent work on the factors which affect (1) the number of eggs laid by the hen (2) the number of eggs which become fertilized, and (3) the number of fertilized eggs which develop normally up to the time of hatching. The effects of increase in length of day on factors (1) and (2) are discussed and illustrated.

364* HAMMOND, J.

"Hereditary Factors in Pigs."

Pig Breed. Annu. 1935-36, 15, 25

A short account of the inheritance of characters in pigs. These may be divided into two groups, (1) those concerning defects or fancy points which have a typically Mendelian segregating mode of inheritance and have arisen by mutations, and (2) those commercial qualities which are of a developmental character, and the expression of which are influenced greatly by the environment.

329* HAMMOND, J.

"The Inheritance of Fertility in the Rabbit."

Rep. 6th Rabbit Breed. Conf., Harper Adams Agric. Coll., Aug. 1934.

The number of eggs shed behaves as an intermediate or blending character in inheritance, while foetal atrophy is a recessive character. A strain with small litters due to a small number of egg shed crossed with a strain with small litters due to foetal atrophy gives individuals which produce large litters. The low fertility often shown on inbreeding is due to the segregation of the recessive foetal atrophy.

HAMMOND, J.

"Large Litters and Small—Why?"

Fmr and Stk-Breed. Pig Suppl. 4th March, 1935, p. xi.

The main causes of small litters are discussed—too late breeding, shortage of sperm in the boar, and foetal atrophy.

327* HAMMOND, J.

"Talk on the 'Proven Bull'."

Farming. J.S.-E. Jersey Club, 1934.

A popular account of the necessity for paying more attention to the bull in the breeding of dairy cattle.

PEASE, M. S.

"Dominance in Poultry."

Proc. Linn. Soc. Lond. 1934-35, p. 85.

A contribution to a discussion of some experimental results obtained by Dr. R. A. Fisher on polydactyly in poultry.

PEASE, M. S.

"The Marans Standards."

Feath. World. June, 1935, p. 856.

The Marans is a breed of poultry recently introduced to this country from France. At present it is a very mixed breed: the article points out that by selective breeding from this mixed stock, it would be easy to establish two standard types—silver and gold—which would exhibit auto-sex linkage working on the same principle as the Cambar.

PEASE, M. S.

"Progress of the Cambar."

Feath. World. Nov., 1934, p. 719.

An account of the improvement so far made in the utility qualities of the Cambar up to the end of the laying season 1934.

PEASE, M. S.

"What is this Mendelism?"

Fur and Feath. Aug., 1935, p. 130.

A report of a lecture given to a conference of rabbit fanciers, in which is discussed the question of how far Mendelism is of use to the breeder of fancy rabbits. Particular reference is made to the problem of the Dutch rabbit, which has been the subject of considerable experimentation on Mendelian lines at Cambridge.

ANIMAL NUTRITION.

339* DUNLOP, G.

"The Calcium, Phosphorus and Vitamin D Requirements of Swine."

J. Agric. Sci. 1935, 25, 22

The results of experiments conducted on 156 swine, from time of weaning till bacon weights were reached, are reported. One hundred and twenty of these animals were subjected to complete dietary control both as regards the quantity of food consumed and the composition of the diet.

Twenty-nine treatments consisting of different amounts of Ca, P and vitamin D added to an otherwise adequate diet, were imposed. The reaction of the animals to the treatments was studied in relation to growth (increase in weight), appetite, utilisation of the food, the blood picture (concentration of serum Ca, blood inorganic P, serum phosphates and blood haemoglobin) and the morphology and chemical composition of the bone.

The different levels of Ca and the Ca/P ratios producing either a normal or an abnormal physiological state in the animals are plotted out in graphical form along with the results, similarly treated, of investigations by other workers. The figure shows at a glance those levels of Ca and P in the diet which are optimum for the nutrition of swine. From the figure some indication is also obtained of the amounts of vitamin D which must be added to a rachitogenic diet to give normal growth and bone formation.

The blood phosphatase was found to be lowest in concentration when the Ca level in the diet was 0.3 per cent, and the Ca/P ratio 1/2.

Some evidence is adduced that the make-up of the cereal portion of the diet exercises some effect on the P requirement of animals. This is ascribed to the varying amounts of phytin P in different cereals.

While the true requirement of an animal for Ca and P must necessarily be dependent on the rate of growth and the economy of gain, the results of this investigation indicate that a diet with a Ca level of 0.45 per cent. and a Ca/P ratio of 1/1.3 is optimal when, as in practice, the average daily rate of growth between the live weights of 30 and 200 lb. varies from 1.0 to 1.4 lb. and the economy of gain from 3.0 to 4.0 lb. of dry matter per lb. of live-weight increase.

338* DUNLOP, G.

“ The Control of Variation in Gain in Animal Nutrition Experiments.”
J. Agric. Sci. 1935, **25**, 151

The cause of variation in the live-weight increase of animals on experiment has been further investigated. It was shown in a previous paper (*J. Agric. Sci.* 1933, **23**, 580) that varying food-intakes and initial weights—as met with in group feeding experiments—accounted for much of this variation. When these two factors are rigidly controlled small differences in the live-weight gains of animals on the same treatment are still obtained. Evidence is presented to show that the basal metabolism and the digestive capacity of animals on the same plane of nutrition are for all purposes the same and cannot account for any great part of the residual variation.

The results indicate that differences in the proportion of fat to protein laid down affect the magnitude of the gains of the animals and thus live weight increase *per se* is an unreliable measure for determining the nutritive value of rations. It has been found that thickness of back fat is an excellent index to the percentage of fat in the carcase and consequently to the proportion of fat to protein laid down. By correcting the observed live weights by a factor incorporating these back fat measurements, the gains can be calculated on an equal energy basis. These corrected live weights show little variation among individuals on the same treatment (standard deviation approximately 1 per cent.)

The equalisation of the food intake over the experimental period (with varying consumption over small intervals) appears to allow for comparatively large variations in live-weight gains. The necessity of keeping the plane of nutrition constant either in accordance with increasing live weight (as in the Cambridge technique) or from day to day (as in the paired-feeding technique) is stressed.

373* DUNLOP, G.

“ The Effect of the Growth-promoting, Appetite-stimulating or ‘ Physin ’ Factor on the Live-weight Increase of Swine.”
J. Agric. Sci. 1935, **25**, 445

Experiments are reported in which rations, adequate as far as our present knowledge of essential dietary constituents goes, were fed to young growing swine. In each of three experiments, animals which received in addition 4 oz. of raw minced liver per day showed a 40 per cent. increase in growth rate compared with the basal groups when food intake was controlled according to the Cambridge technique, the liver-fed animals showed the same gains in weight as the animals receiving the basal diet alone. The substance in liver is thus primarily an appetite-stimulating factor and does not enhance the net energy value of the ration.

Liver supplements gave a greater growth response compared with diets containing either young pasture grass or fish meal. Some evidence of the presence of the appetite-stimulating factor in milk has been obtained but it is shown that raw liver is approximately 40 times as rich on a dry matter basis.

A list is given of a number of foodstuffs, which may be fed to pigs, arranged in order of their “ physin ” potency.

350* DUNLOP, G.

“The Vitamin A Requirement of Swine.”

J. Agric. Sci. 1935, **25**, 217

The experiments reported were carried out to obtain information on the types and amounts of common foodstuffs which should be included in a ration for the prevention of avitaminosis A in swine. The actual vitamin A requirement of swine in terms of carotene was also investigated.

Ten different diets were used and three animals placed on each. The carotene content of the different foodstuffs was estimated colorimetrically and the vitamin A potency of each diet determined. Seven of the diets produced the classical symptoms of avitaminosis A in the animals, two contained minimal or just sub-minimal amounts, while one appeared to permit storage.

The rations on which avitaminosis A did not appear contained either maize meal or alfalfa meal but, since these are not standard products and produce undesirable effects when fed in large amounts, it is suggested that the simplest method of meeting the requirement of bacon pigs for vitamin A is the dosing of the young animals with a concentrate of known potency at the rate of 1,000,000 I.U. per animal. The fattening ration may then be composed of the cheapest foodstuffs available irrespective of their vitamin A content.

On a diet high in maize, growth ceased in all three animals. Small supplements of yeast proved sufficient for recovery and resumption of normal growth. It is suggested that the failure of the animals to grow was due to a deficiency of vitamin B₂ in the diet.

In four animals which died during the experiment post-mortem examination revealed extensive enteritis, while estimation of the vitamin A content of the livers showed that the animals had depleted their body reserves of the vitamin.

The amount of vitamin A necessary in the diet to keep the animals' reserves at their original level is shown to be 60 mg. carotene per 100 lb. food consumed, or alternatively, the vitamin A requirement of a 100 lb. pig for maintenance and normal growth (1·3 lb. per day) is 4 mg. of carotene per day.

358* CRUICKSHANK, E. M.

“Vitamins and Minerals in Poultry Nutrition.”

Nut. Abstr. Rev. 1935-36, **5**, 1

A survey of the work from 1923 onwards relating to poultry nutrition. Part I consists of a general introduction indicating the characteristic differences between fowls and mammals. Part II deals with the distribution of vitamins in poultry foods, the symptoms of vitamin deficiencies in fowls and the vitamin requirements, as far as has been ascertained. The effect of the diet on the composition of the egg is also discussed. Part III refers to calcium and phosphorus metabolism during the reproductive cycle, the calcium and phosphorus requirements of the growing chick and to the disease known as perosis, which appears to be associated with an unsuitable calcium : phosphorus ratio. The rôle of other minerals, viz., iodine, fluorine, magnesium, sodium chloride, iron and copper in the nutrition of the fowl is also discussed. Part IV contains a short summary, and indicates the importance of further research on the relation of vitamins and minerals to the incidence of poultry disease. 227 references are given.

EDWARDS, J.

"Feeding Does Affect Butter-fat."

Fmr and Stk-Breed. 1934, 48, 2645

An account of experiments conducted with such fats as butter-fat, corn oil, linseed oil, lard and tallow, showing that over short periods (6 days) of feeding increases up to 20 per cent. could be obtained. The increase was maintained for 24 hours after fat-feeding ceased and the return of fat in the milk was 20 per cent. of the extra fat consumed.

HALNAN, E. T.

"The Scientific Principles of Poultry Feeding." 3rd ed.

Bull. No. 7. Minist. Agric. and Fish. 1934. (H.M.S.O., London, Price 9d.)

HALNAN, E. T.

"A Note on the Starch Equivalent Required to Produce 1 lb. Live-weight Increase during Trough Feeding and Cramming."

Appendix to Bull. No. 91. Minist. Agric. and Fish. 1935. (H.M.S.O., London, Price 1s.).

From examination of the data of the poultry fattening experiments carried out at Wye College, Kent, the starch equivalent required to produce 1 lb. live-weight increase in Light Sussex chickens was as follows :—

1. During Trough Feeding.		Food Mixture Used.	
Sussex ground oats	13	Sussex ground oats	6½
Dried skim milk	1	Maize meal	6½
		Dried skim milk	1
Cockerels	2·366		2·918
Pullets	2·763		3·035
2. During Cramming.		Food Mixture Used. (As above with 1 part of fat added)	
Cockerels	2·981		3·271
Pullets	3·471		3·616

The following facts emerge from these data :—

(1) the amounts of S.E. required to produce 1 lb. increase in live weight are less for cockerels than pullets of the same age,

(2) more S. E. is required to produce 1 lb. live-weight increase during cramming than during trough feeding, and

(3) the comparative efficiency of the foods used to produce gains ranks in the following order :—Sussex ground oats, barley meal, maize meal.

HALNAN, E. T.

"Poultry Diets."

Glos Fmr. 1935, 3, 105

Ceylon Poult. Club Yearb. 1935, 7, 56

HALNAN, E. T.

"Recent Developments in Poultry Feeding."

Feath. World. 1934, 90, 889

313* WOODMAN, H. E.

"The Composition and Feeding Value of Lucerne."

J. Minist. Agric. 1934, **41**, 137

This paper summarizes the results obtained in the Cambridge investigations into the influence of systematic cutting at different stages of growth on the yield, composition and nutritive value of lucerne. It is a record of the earlier results of the Cambridge lucerne work obtained during the season 1932, when four separate crops of lucerne, situated in different localities in East Anglia, were investigated from the standpoints of yield, composition and feeding value. For a record of subsequent work on this subject, the article published in the *J. Agric. Sci.* 1934, **24**, 283 should also be consulted.

340* WOODMAN, H. E. and EDEN, A.

"Nutritive Value of Lucerne. III. The Composition, Digestibility and Nutritive Value of Lucerne Hay, Lucerne Meal (English and American) and Lucerne Leaf Meal (American)."

J. Agric. Sci. 1935, **25**, 50

The practice of drying lucerne by artificial means and grinding the dried product to a meal has been a recognised industrial process in the United States for some years past. Lucerne meal made in this way has acquired considerable popularity as an ingredient of poultry foods, and fairly large amounts have been imported for this purpose into Great Britain. It is only quite recently that attempts to establish the practice in this country have been made. The results embodied in this publication are therefore of interest both to the farmer and to those industrial concerns engaging in the production of lucerne meal.

334* WOODMAN, H. E. and OOSTHUIZEN, P. M.

"Nutritive Value of Pasture. XI. The Composition and Nutritive Value of Winter Pasturage."

J. Agric. Sci. 1934, **24**, 574

An investigation designed to elucidate the nutritional characteristics of pasture grass during the winter season. The yield, composition and digestibility were determined of pasturage produced by unrestricted growth over the following periods :— (1) end of July to December (2) end of August to January (3) end of September to February, and (4) end of October to March.

ANIMAL PATHOLOGY.

324* DUNLOP, G.

"Paralysis and Avitaminosis A in Swine."

J. Agric. Sci. 1934, **24**, 435

A description is given of a peculiar condition which developed in 10 experimental animals out of a group of 30, when 5 months old, after being fed rations recommended for general use in this country. It was found that the 10 pathological cases were pigs from two litters which had received a different diet from the 20 normal animals at time of weaning, although all 30 animals had been fed the same rations from weaning time (8 weeks) till onset of the symptoms.

The early symptoms of the disease are characteristic by refusal of food and cessation of growth (increase in weight) coincident with a peculiar unsteady swaying gait in the rear limbs. At a later stage the power of the limbs is completely lost and a spastic or convulsive condition may develop till the animal finally becomes prostrate.

Therapeutic treatment was commenced and supplements of 10 mg. crystalline carotene or 5 ml. cod liver oil added to the ration gave an immediate response, while a less marked response was obtained with large doses of orange juice. In a remarkably short period of time the animals had regained their appetite for food, the symptoms of the disease diminished in severity, the power of the limbs was restored and within a month the affected animals were indistinguishable either physiologically or clinically from the other animals which did not develop the disease.

The cause of the condition was found to be a deficiency of vitamin A in the diet. This conclusion was arrived at from the results of blood and bone analyses, estimations of the vitamin A content of the liver of the animals and determinations of the carotene and vitamin A content of the foodstuffs and the supplements fed. The vitamin A requirement of swine was shown to lie between 17 and 70 mg. of carotene per 100 lb. dry matter consumed.

An historical review of the literature relating to the disease is given and the application of the findings to swine under practical conditions of management is discussed.

WALTON, A.

"Medical Research and the Farmer."

C.U. Agric. Soc. Mag. 1934, 4 (No. 2), 46

ANIMAL PHYSIOLOGY.

331* CRUICKSHANK, E. M.

"Studies in Fat Metabolism in the Fowl. 1. The Composition of the Egg Fat and Depot Fat of the Fowl as Affected by the Ingestion of Large Amounts of Different Fats."

Biochem. J., 1934, 28, 965

On normal cereal rations containing protein supplements, the mixed fatty acids of the egg fat contained about 31 per cent. solid acids, 47-51 per cent. oleic acid, 15-19 per cent. linoleic acid and 2-3 per cent. linolenic acid. While the degree of saturation and the proportion of the component fatty acids could be considerably modified by the ingestion of unsaturated fatty acids, the ingestion of saturated fatty acids had relatively little effect in altering the normal composition of the mixed fatty acids of the egg fat.

Observations on individual birds showed that the ingestion of high percentages of saturated fatty acids in the form of palm kernel oil and mutton fat definitely increased the degree of saturation of the mixed fatty acids of the depot fat, while the ingestion of unsaturated acids in the form of hempseed resulted in a marked and rapid increase in unsaturation.

The superficial and internal fat reserves are more uniform in composition than in the case of pigs and cattle.

347* DEIGHTON, T.

"A Study of the Fasting Metabolism of Various Breeds of Pig. II. Body Temperature Measurements."

J. Agric. Sci. 1935, **25**, 180

The normal body temperature of pigs is more variable than has hitherto been supposed and the average normal rather lower, 101.7°F.

A definite reduction of body temperature of 1.7°F is observed in fasting, and both normal and fasting figures are higher in youth.

The reduction of temperature in fasting appears to be independent of age, environmental temperature, light, etc., and hogs are considered to resemble rats and guinea-pigs in being incompletely thermoregulated.

363* HALNAN, E. T. and DAY, H. D.

"An Analysis of Egg Faults."

J. Minist. Agric. 1935, **42**, 236, 326

Consists of an analysis of egg faults occurring in 164, 831 eggs laid in the West Suffolk Egg-laying Trials. The egg faults of most frequent occurrence are meat spots, large air space, watery whites, deformed or thin shells and dropped yolks. Egg faults occur most frequently during the summer months but the reason for this was not established. The assumption that high producing birds produce more faulty eggs than low producing birds was not supported by the evidence of this analysis. Feeding and management conditions were shown to be a secondary rather than a primary cause of egg faults. The occurrence of egg faults was shown to be associated with individual birds, and it is suggested that the intelligent use of the candling lamp by breeders, followed by rejection as breeding stock of all birds proved to lay faulty eggs should go far towards eliminating faults in eggs produced in this country.

HAMMOND, J.

"The Changes in the Reproductive Organs of the Rabbit during Pregnancy."

Trans. Dynam. Devel. (Moscow) 1935, **10**, 93

A quantitative investigation of the growth rate of the different parts of the embryo and reproductive organs during pregnancy. The maternal placenta reaches its maximum growth rate earliest (at the 14th day), the foetal fluids and foetal placenta come next and reach a maximum about the 22nd day, while the remaining parts (the foetus, the uterus, the vagina and the mammary glands) go on increasing in rate of growth until the end of pregnancy. The attachment relations between the maternal placenta on the one hand, and the foetal placenta and uterus on the other, change during the course of pregnancy. The ratio between the weight of the foetal and maternal placentas increases as pregnancy proceeds. There is very little correlation between the weight of the foetus and the weight of the foetal placenta at the 16th day of pregnancy but there is a very marked correlation at the 32nd day. The scale on which the organism starts has much to do with determining the ultimate size of the organism. The absorption of the foetal fluid, which begins after the 24th day, is an active one by the living foetus, for in cases of foetal atrophy large amounts of fluid remain unabsorbed at the end of pregnancy. Inhibition of the growth of

foetuses in large litters is not due to lack of space caused by the large number present in an uterine horn, but to limitation of some nutritional substance in the blood supply of the mother. The growth of the uterus during pregnancy can be resolved into two parts; the one part is dependent on an internal secretion in the blood stream, and does not take effect until after about the 18th day, while the other part is due to a direct contact effect of the embryos on the uterine horn, so that it enlarges proportionally to the number of embryos present. The vagina has a period of active growth during pregnancy, which enlarges it to admit passage of the young at birth. The time relations between the growth of the vagina and growth of the mammary glands are very close, so that it is not improbable that their growth may be caused by the same internal secretion. The factors leading to easy birth and after-development are largely bound up with the changes which are going on in the reproductive organs before birth occurs.

HAMMOND, J.

"Fertility in Mares."

Fmr and Stk-Breed. 1935, 49, 796

A popular account of some of the recent advances which have been made in the physiology of reproduction in the mare. Among the points dealt with are the best time in the heat for service, the interval between one heat and the next, and the diagnosis of pregnancy by the nature of the mucin in the vagina.

HAMMOND, J.

"Oestrus and Ovulation in the Mare."

Proc. 15th Int. Physiol. Congr., Leningrad, 1935.

Causes for variations in the length of oestrus and of the oestrous cycle are discussed. Ovulation occurs about 24 hours before the end of oestrus. The enlargement of the follicle during oestrus is remarkable. After rupture of the follicle by hand through the rectal wall, oestrus continues for only just under or just over 24 hours, according as the follicle is ruptured at an early or later stage of development. When ruptured early in oestrus the follicle does not form a corpus luteum, but does so when the rupture is made later in oestrus. Experimental removal of the embryo at the 54th day of pregnancy leads to the recurrence of oestrus within about 4 days.

314* HAMMOND, J.

"Quelques progrès nouvellement faits dans la science relative à la reproduction des chevaux."

Act. 16th Congr. Int. Agric. Budapest, June, 1934.

A summary of the practical bearings of the research on the physiology of reproduction in horses which has been made during the last few years. The subject is discussed under the following headings: (1) the breeding season (2) the duration of heat (3) ovulation and fertility (4) stallions and artificial insemination (5) tests for pregnancy (6) the duration of pregnancy, and (7) growth and development of the foal. Photographs are given to show the changes in the proportions of the horse in development and during evolution. The evolution of the Light Horses is proceeding as a magnification in size of the proportions at birth while that of the Heavy Horses is proceeding as a super-development of the changes in proportions which occur after birth in the comparatively unimproved pony.

325* HAMMOND, J. and WALTON, A.

"Notes on Ovulation and Fertilization in the Ferret."

J. Exp. Biol. 1934, 11, 307

The ferret ovulates normally about 30 hours after coitus.

The average duration of coitus is about 2 hours but varies from $\frac{1}{4}$ hour to 3 hours. There was no evidence that short copulations were less fertile than long ones.

For 36 hours after coitus the vulva remains turgid, but becomes flaccid by about 60 hours after coitus, presumably from the absence of oestrin.

Spermatozoa reach the upper part of the uterus within about 3 hours after coitus, but during this time do not reach the ovarian capsule. Spermatozoa were found in the ovarian capsule 6 hours after coitus. No spermatozoa were found in the ovarian capsule or uterus 10 days after coitus.

An attempt to determine the possible duration of fertilizing capacity of the spermatozoa in the female tract was made, but no conclusive results were obtained owing to the difficulty of performing artificial insemination in the ferret.

In the ferret the ovum remains capable of fertilization for not more than 30 hours after ovulation. From 18 to 30 hours after ovulation only a small proportion of the ova remain capable of fertilization, and small litters are produced from matings made at this time.

325* HAMMOND, J. and WALTON, A.

"Pregnancy during the Anoestrous Season in the Ferret."

J. Exp. Biol. 1934, 11, 320

The behaviour of ferrets which become pregnant or pseudo-pregnant at the end of the breeding season, so that these states are extended into the time normally occupied by anoestrus, has been investigated.

Pregnancy can go on quite normally during this time.

While the presence of an anterior-pituitary-like substance in the blood (as found in the pregnant urine of man and the horse) might be suggested as a means by which the ovarian secretions are maintained in pregnancy during the anoestrous period of time, these substances, as far as is at present known, exist only in the urine of those species in which the corpus luteum does not persist throughout pregnancy.

Since the full pseudo-pregnant changes can also take place during the anoestrous period of time it is suggested that the corpus luteum can produce its internal secretions at a lower anterior pituitary level in the blood (such as exists during anoestrus) than is necessary for follicular development and the production of oestrus.

332* MARSHALL, F. H. A. and BOWDEN, F. P.

"The Effect of Irradiation with Different Wave-lengths on the Oestrous Cycle of the Ferret, with Remarks on the Factors Controlling Sexual Periodicity."

J. Exp. Biol. 1933, 11, 409

The recurrence of oestrus in the female ferret is greatly accelerated by irradiation with light of various wave-lengths. Heat rays and the near infra-red (λ 7500) are comparatively inactive. The effect begins with the red radiation (λ 6500) and extends throughout the visible to the near ultra-violet (λ 3650). Over this range of the spectrum intensity appears to be more important than wave-length.

None of the wave-lengths employed produced retardation in the recurrence of oestrus.

Female ferrets subjected to incomplete darkness did not come on heat but individuals which had already begun to come on heat entered into full oestrus and remained in that state for a normal period.

It is concluded that in the ferret and so probably in many other animals light radiations of particular wave-length and sufficient intensity are an efficient cause of reproductive activity, but that the recurrence of the oestrous cycle is conditioned also by other factors which in the absence of variation in the daily duration of light may play an important part.

369* MARSHALL, F. H. A. and VERNEY, E. B.

“Ovulation and Pseudo-pregnancy in the Rabbit as a result of Nervous Stimulation.”

Proc. Physiol. Soc., July 6th, 1935. *J. Physiol.* Vol. 85.

Ovulation of the rabbit does not normally occur except after coitus or after the orgasm. The authors found that electrical stimulation of the nervous system of a female rabbit in an oestrous condition was followed by ovulation. It is presumed that the stimulus acts through the intermediation of the anterior lobe of the pituitary.

333* SMELSER, G. K., WALTON, A. and WHETHAM, E. O.

“The Effect of Light on Ovarian Activity in the Rabbit.”

J. Exp. Biol. 1934, **11**, 352

The mature Graafian follicle does not persist indefinitely in the oestrous rabbit but is rather short-lived, so that during oestrus numbers of follicles appear and disappear, the series over-lapping so that at any one time there are approximately the same number of mature follicles on the surface of the ovary and heat and potential fertility are continuous.

Mating response, ovulation and pseudo-pregnancy proceed normally in rabbits subjected to periods of 30 days' intense illumination or almost total darkness. The number of ovulations was slightly higher in those subjected to light. This is perhaps sufficient to indicate that ovarian activity is not altogether insensitive to light but when a small number of does which failed to ovulate was omitted from the data the difference was considerably reduced and ceased to be statistically significant.

ANIMAL PRODUCTION.

EDWARDS, J.

“The Gamble of the Bull.”

Fmr and Stk-Breed. 1935, **49**, 2179

EDWARDS, J.

“A New Milk Recording Service. The Ministry's Scheme for the Progeny Recording of Dairy Bulls.”

Rep. Centr. Coun. Milk Rec. Soc., 1934, p. 87. (and all County Milk Rec. Soc. publications)

A description of the value to be derived from bull-recording by a scheme originally suggested by the Animal Nutrition Research Institute, Cambridge.

EDWARDS, J.

“The Progeny Recording Scheme for Dairy Bulls and the Register of Merit.”

Dairy Short. J. 1934, 4, 98

It is suggested that the Register of Merit for Dairy Shorthorn Bulls should be remodelled on the lines of the Ministry's Progeny Recording Scheme ; it would then include a greater number of bulls and the information about them would be more complete.

HAMMOND, J.

“Changes in Meat-consumers' Tastes.”

Fmr and Stk-Breed. 1934, 48, 2775

Tenderness in meat is now of more importance than high flavour. Tenderness is associated with fineness of grain and small muscle bundles ; these occur in small and in young animals. Not too much subcutaneous fat is required in pork and mutton, the optimum thickness of fat over the “eye” of the loin being only $\frac{3}{16}$ inch in mutton carcasses.

321* HAMMOND, J.

“History and Review of the Smithfield Carcass Classes.”

Pig Breed. Annu. 1934-35, 14, 151

An account of the carcass classes for pigs at Smithfield Show. The changes which have taken place in these classes since they were instituted are given as presenting a picture of the changes occurring in consumers requirements. Suggestions are made as to possible future improvements by the introduction of a score card.

342* HAMMOND, J.

“The Inheritance of Productivity in Farm Live Stock. I. Meat.”

Emp. J. Exp. Agric. 1935, 3, 1

Repr. in *La Res.* (Buenos Aires) 1935, 3, 2085

It is suggested that the characters of our domestic animals have arisen in two ways (1) by mutations of genes, giving rise for the most part to fancy points or defects of development, and (2) by the development of new genes through changes in the animal as a result of the environment.

Since the genetic characters concerned in meat-production are so dependent for their expression on the environment, especially nutrition (and are mostly of a developmental character), our best means of directive improvement is selection (by progeny tests) in a suitable environment, that is, one which stimulates the development of the character in question. The further development of these commercial qualities in our animals depends, like the ‘civilization qualities’ in a man, on the creation of a better environment for the development of the characters concerned.

Examples of the two different types of characters are referred to in horses, cattle (beef and veal), sheep (mutton and lamb) and pigs (bacon, pork and lard) and are illustrated by photographs and diagrams.

HAMMOND, J.

"Our Beef Production Can Be Doubled."

Farms' Wkly. 1935, 3, (No. 7), 13

A survey of the present state of beef production and suggestions for possible future lines of development.

319* HAMMOND, J.

"Pig Recording."

Roy. Lancs. Agric. Soc. J., 1934.

The advantages of pig recording as an educational basis for coping with the conditions of pig production revealed by the working of the Bacon Pig Marketing Scheme are outlined. The ways in which pig recording can assist the producer in his problems are discussed under the following headings which pig recording measures. (1) The number and weight of the litter at weaning time (8 weeks old), (2) the number of days required to grow the pig to bacon weight, and (3) the quality of the bacon produced.

354* HAMMOND, J.

"The Production of Pigs for Bacon: Carcase Quality and Breeding for it."

Roth. Conf. 1935, 19, 10

A short account of the various points which go to make up good carcase quality.

HAMMOND, J.

"The Quality Problem in Relation to Meat."

Rep. Brit. Ass. Sect. M. Agric. Norwich, 1935.

The change in public taste, and consequently quality, has been towards (1) smaller joints (2) leaner meat, and (3) more tender meat. This has involved changes in the proportions of the different meats consumed. If subsidies are to be used to help the British producer of meat, they should be given on a quality basis.

MENZIES-KITCHIN, A. W.

"Pig Recording and Efficient Production."

Rep. Centr. Coun. Milk Rec. Soc., 1933, p. 69.

The main problem is to reduce costs of production and this can be done most efficiently by

- (a) the selection and use of breeding stock from strains of proved prolificacy,
- (b) breeding these sows as often as possible and marketing the greatest possible number of pigs from them in each year,
- (c) by the use of suitable breeds of pigs,
- (d) by the care of the sow before, and of the sow and litter after farrowing,
- (e) by attention to the aspect and construction of the piggery,
- (f) by marketing the pigs at correct weights, and
- (g) by the adoption of careful scientific methods of feeding and management.

344* OXLEY, C. D.

"Seasonal Variation of the Percentage Butterfat Content of Milk. An Examination of the Results of Certain Individual Cow Tests."

Dairy Res. 1935, 6, 1

Figures showing the means and the standard deviation of butterfat percentage of milk samples, at the afternoon and morning milkings respectively, during the four quarters of the year are presented.

The probable sources of error due to the nature of the sample are discussed and the seasonal variability of the mean and of the standard deviation is considered.

The likelihood of the mean of afternoon or of morning milk failing to reach certain specified minima during the respective seasons is calculated.

362* OXLEY, C. D.

"A Study of Progress of Lactation in Relation to the Milk Yield and the Butterfat Percentage of Milk Produced by Cows of Shorthorn Type."

Dairy Res. 1935, 6, 113

The mean and the standard error of the mean of milk yield and of butterfat percentage have been determined for each of the first five successive Milk Recording Society tests of both afternoon and morning milk.

The yield of butterfat and the correlation coefficient of milk yield and butterfat percentage at each test have been calculated.

The relationship of successive test results and of morning and evening results at the same period is discussed.

SANDERS, H. G.

"Causes of Herd Wastage."

Fmr and Stk-Breed. Dairy Suppl. 1st April, 1935, p. xvi.

312* WALTON, A. and EDWARDS, J.

"Artificial Insemination and Dairy Farming."

Handb. S. Devon Distr. Milk Rec. Soc., 1934.

A simple account of artificial insemination written for the farmer, outlining the possible practical applications and the special difficulties which have to be considered in adapting artificial insemination to dairy farming. The principle advantages are the increased number of calves obtainable from a proven sire and the transport of semen to a distance. The chief difficulties are the collection of semen when actually required and the coordination of collections with the onset of heat in the cows it is desired to inseminate.

320* WHETHAM, E. O.

"Tables Showing the Carcass Weight, Carcass Percentage and Age in Relation to the Live Weight of Pigs."

Pig Breed. Annu. 1934-35, 14, 188

FORESTRY.

THOMPSON, C. H.

"Bamboo."

C.U. Agric. Soc. Mag. 1935, 4 (No. 3), 30

PHYSICAL CHEMISTRY.

WOODMAN, R. M.

"Problems Connected with the Preparation and Application of Emulsions used in Agricultural Spraying." Pp. 57-89. Contribution to "Technical Aspects of Emulsions." Pp. 150."

Price 6s. 6d. net. Harvey, 17 Market St., London, 1935.

WOODMAN, R. M.

"Recent Researches on Insecticides in Great Britain : Physico-Chemical Investigations."

5th. Pacific Sci. Congr. Vancouver, 1933, p. 3432.

WOODMAN, R. M.

"Studies in Emulsions. III. Lipin-containing Substances as Emulsifiers."

J. Soc. Chem. Ind. 1935, 54, 70T

Aqueous dispersions of lipins from various sources and of various ages yield dual emulsions on shaking by hand with fat solvents. At oil-rich phase volume ratios, both types of emulsions appear to be simultaneously present (possibly as complex emulsion systems), as far as can be judged by drop tests. It is thought that a possible explanation of this behaviour might be the presence in the lipins of opposite-type emulsifiers, which simultaneously exert their actions to some extent independently of each other.

PLANT BREEDING AND GENETICS.

BELL, G. H. D.

"Crops and Plant Breeding."

Fmrs' Guide Agric. Res. 1933.

J. R. Agric. Soc. 1934, 95, 169

A general analysis of the questions underlying yield in sugar beet is first considered, with special reference to the production and utilisation of new varieties. This is followed by a brief consideration of cultivation and management factors, and in particular the plant population problem, as they affect the yield of sugar per acre.

This is followed by a brief survey of the present knowledge concerning the nature of viruses. Particular stress is laid on virus transmission and spread in the field, with particular reference to the potato crop.

The third section deals with potato breeding ; the attempt to produce improved varieties resistant to blight and the more important virus diseases ; and the raising of virus-free stocks. The results of recent variety trials are also included.

The article concludes with a short account of the significance of synonymy and "new varieties." Examples of synonymous varieties in the cereals and the potato are given.

BIFFEN, R. H.

"The Thing We Call Wheat. Wheat Breeding."

Miller. 1935, **61**, 365

A review of wheat breeding since 1875.

About the turn of the century tests were made to see if hard wheats could be grown under English conditions and it was found in the case of Red Fife that strength was a varietal characteristic, only affected to a relatively small extent by environment. The yield of this variety was, however, too low for successful cultivation in England, and so, applying the then recently rediscovered principles of Mendelism, efforts were made to combine its quality with the high yield of English wheats. There appeared to be some "linkage" (a genetical phenomenon which was then just being discovered) between quality and yield, but by growing very large progenies and selecting, forms were obtained in the fifth generation combining the desired characters. One of the forms thus obtained was Yeoman. This wheat, while vastly superior in quality to other English wheats was somewhat erratic in yield, giving heavy crops under good conditions, but only average yields in the country as a whole. It is however, serving as a basis for the breeding of other hard wheats suited to soil conditions in different parts of the country, and is also being used in European countries for similar purposes.

It was also found in the early days that plant diseases could be controlled by plant breeders, and the breeding of varieties resistant to rust and other diseases has formed an important aspect of wheat breeding. In connexion with rusts the author refers to the difficulties introduced by the phenomenon of physiological specialization in the fungus and by linkage between undesirable characters and rust resistance. These have now largely been overcome and rust resistant bread wheats are available to cultivators. Other diseases are also being attacked by breeders, in some cases with success, e.g. mildew and smut, but in others, especially the "foot rots" with less success, owing to the difficulty of finding resistant forms.

Improvements have recently been brought about in the straw of wheat, whose stiffness limits the yield to about 32 bushels per acre at present. Much stiffer forms have been produced, and also shorter types suited to mechanical harvesting.

323* ENGLEDDOW, F. L. and PAL, B. P.

"Investigations on Yield in Cereals. VIII. Hybrid Vigour in Wheat."

J. Agric. Sci. 1934, **24**, 390

Hybrid vigour, a problem of leading importance in both genetics and plant breeding, was studied in certain wheat crosses. In one (Little Joss x Thule) clear evidence of a small increase in vigour in F_1 was obtained. This was investigated also in F_2 and F_3 in the cross and its reciprocal. About one hundred other crosses were

made on a smaller scale and from these certain general indications as to the nature of hybrid vigour were obtained. From examination of all the published cases of hybrid vigour it appears that the phenomenon occurs preponderantly in crosses among parents which are (a) diploid, (b) naturally out-pollinating, and (c) endospermic in seed.

HUDSON, P. S.

"The Imperial Bureau of Plant Genetics."

13th Conf. Docum. Copenhagen, 1935.

360* HUNTER, H.

"The Improvement of Winter Oats."

J. Agric. Sci. 1935, **25**, 419

This paper is an account of some of the essential results obtained from the crossing of a spring oat characterised by straw of good standing power with Grey Winter which is a winter oat possessing high grain quality. A number of selections from the cross are studied in relation to their winter-hardiness, strength of straw, quality of grain and length of growth period.

No selection was found to equal the winter-hardy parent in winter hardiness although several did so in grain quality. Straw of desirable resistance to "lodging" was obtained in some selections in association with high grain quality and relative earliness in ripening, and all these characteristics in conjunction with a high degree of resistance to winter conditions. Two selections were advanced to the yield-testing stage and both were shewn to be significantly superior to Grey Winter in the yield of grain. One of these has recently been introduced in general use under the name Resistance.

Reference is also made to a series of forms derived accidentally from one of these two selections; they are remarkable for a degree of winter-hardiness, sometimes in excess of Grey Winter, good straw and high grain quality.

HUNTER, H.

"Report on a Visit to certain Plant Breeding and other Experimental Stations in Finland, September, 1934."

Minist. Agric. and Fish., London. Pp. 8. (Mimeographed).

The organization of the Department of Plant Breeding at Jokioninen and its relations with other research bodies is outlined and a general survey is given of cereal breeding in Finland. Owing to the importance of cold resistance the land varieties which are adapted to the rigorous climate constitute particularly useful initial material of which advantage is taken in the breeding of wheat, rye, barley, etc.

The performance and characteristics of a number of the most important productions obtained by selection from land wheats or by selection and hybridization are cited.

In rye breeding, standing capacity of straw and rust resistance are considered.

The geographical distribution of native varieties of barleys and their taxonomic identification are dealt with and their use in breeding by selection and crossing indicated.

The basis of the method used in breeding cold-resistant wheats is specially mentioned.

HUNTER, H.

"Report of a Visit to certain Plant Breeding Stations in Denmark, Sweden and France, September, 1933."

Minist. Agric. and Fish., London. Pp. 14. (Mimeographed).

Denmark. A visit was made to Øtoftegaard where root breeding is an important feature, attention being specially directed to the quality, resistance to disease and resistance to low temperatures of various new strains. The latter is determined in a specially constructed freezing chamber which is also used for the determination of the relative low temperature values of cereals, particularly wheat, and clovers and grasses.

The present position with regard to barley breeding in Denmark is described in relation to the agricultural and brewing values of new varieties now emanating from Abed Plant Breeding Station. These new varieties are produced from Hanna and other "land" barleys. The original objective of improvement was stiffer straw, but higher grain productivity has also been obtained in the new sorts Kenia and Maya.

The existing position with regard to oat breeding and the control of certain oat diseases in Denmark is described.

Sweden. The breeding objectives in the case of wheat, barley and oat breeding in this country are described, together with a short account of the characteristics and range of adaptability of the most recent introductions. The production of winter cereals at Svalöf is based upon cold-resistance tests carried out in a special plant installed at that station; the salient points of this plant are briefly described.

France. The plant breeding establishment was visited and observations made on the breeding procedure and objectives adopted here. In the case of barley it was ascertained that Hanna, as in Scandinavia, forms the basic material. The value of recent selections of this barley are demonstrated by results obtained by the Société d'Encouragement de la Culture des Orges de Brasserie which has established field experimental centres in all the French barley-growing districts.

O'CONNOR, C.

"Breeding and Selection for Immunity against Disease."

Rep. 3rd Imp. Mycol. Conf. Sept., 1934, p. 25.

An account of the breeding of potatoes resistant to *Phytophthora infestans* at Cambridge.

SALAMAN, R. N.

"Report of the Potato Synonym Committee on the Potatoes sent for Immunity Trials to the Potato Testing Station, Ormskirk, Lancs, 1933."

J. Nat. Inst. Agric. Bot. 1934, 3 (No. 4), 386

These deal with the varieties new and old sent to Ormskirk for susceptibility tests against Wart Disease.

375* SALAMAN, R. N.

"Research in Relation to the Production of 'Good' Potato Seed."

Agric. Prog. 1934, XI, 77

An account is given of the researches in resistance to *Phytophthora infestans* which were originated by the author in 1906. During the last 13 years the work has taken on

a definitely economic aspect and many strains of highly resistant varieties of considerable promise have been bred. The source of the resistance has been found in *S. utile* and in *S. andigenae* variety Aya Papa.

During the last seven years the major part of this research has been carried out by Miss O'Connor who has shown that there are at least two different strains of the fungus and that a potato variety which is resistant to one may succumb to the other. Certain varieties have proved resistant to both types.

The methods employed at Cambridge for the detection and preservation of virus-free stocks of the various varieties of the potato are described. In certain varieties strictly virus-free stocks have not been found and in such cases those with the least number of viruses of the lowest virulence have been maintained. The method of growing stocks in isolation and the value of virus-free stocks is demonstrated.

WATKINS, A. E.

"The Practical Application of Genetical Science to Plant Breeding."

Emp. Cott. Gr. Corp. 2nd Conf. on Cotton Growing Problems, July, 1934, p. 14.

Consideration was given to the circumstances under which the plant breeder may most reasonably expect success, and to the directions in which genetics is most likely to give assistance.

377* SALAMAN, R. N.

"Russian Research on the Potato."

C. U. Agric. Soc. Mag. 1935, 4 (No. 3), 22

This is an analysis and evaluation of the extensive work which has been done by Soviet Russian scientists. A large number of new *Solanum* tuber-bearing species and still larger number of varieties have been discovered as a result of their expeditions in Mexico, Central and South America. Many of the new types possess qualities of great value, such as resistance to *Phytophthora infestans*, resistance to frost, early ripening, and a short dormancy period. Attempts to incorporate these into varieties of economic value are being pursued. In addition, valuable work of a purely scientific character has been done on the cytology and the genetics of the potato.

PLANT PATHOLOGY.

337* BAWDEN, F. C.

"Studies on a Virus Causing Foliar Necrosis of the Potato."

Proc. Roy. Soc. 'B.' 1934, 116, 375

An account is given of the purification and of certain *in vitro* properties of a hitherto undescribed potato virus, provisionally named potato virus "D." The disease induced by this virus varies with the potato variety infected, and the reactions of 28 commercial varieties to infection are described. On certain varieties virus "D" causes a characteristic necrotic disease, foliar necrosis.

It is shown that plants infected with virus "D" acquire a resistance to further infection with potato virus "X," and *vice versa*. The extent of this resistance varies somewhat and depends on the species and on the rapidity of growth of the host plant. The possible reasons underlying this acquired resistance and the relation between viruses "D" and "X" are discussed.

PETHERBRIDGE, F. R. and STIRRUP, H. H.

"Pests and Diseases of the Sugar-beet."

Bull. No. 93. *Minist. of Agric. and Fish.*, 1935 (Obtainable from H.M.S.O., London. Price 1s. 6d. net).

This bulletin gives an account of the present-day knowledge of sugar beet pests and diseases and has been compiled after a study of the most recent publications on this subject and after personal discussions with many of the leading Continental workers. It is hoped that the information set forth will assist growers to recognise the various pests and diseases, should any of them appear in their fields, and provide advice as to how to deal with them.

376* SALAMAN, R. N.

"A New Potato Epidemic in Great Britain."

Nature. 1934, **134**, 932

Describes the widespread infection of potato stocks in Great Britain by *Alternaria solani*.

SALAMAN, R. N.

"Report on a Scheme for Raising Virus-free Potato Stocks."

An unpublished scheme prepared for the consideration of the Potato Marketing Board, the object of which is to improve the potato seed stocks of the United Kingdom.

The underlying idea is that virus-free stocks should be raised under insect-free conditions and multiplied for 3 years on the sea-gull islands or coastlands of the north-west of Scotland and 2 years in the potato raising centres of the east of Scotland. Each year fresh virus-free stocks would be imported to the islands and a rotation maintained which would ensure that Scotch seed put on the general market would not be more than 5 years removed from the original virus-free stocks.

A copy has been deposited in the Library of the School of Agriculture.

382* SMITH, K. M.

"Colour Changes in Wallflowers and Stocks."

Gdnrs' Chron. 1935, **98**, 112

Certain variegations which have recently developed in self-coloured wallflowers and stocks are shown to be due to infection with a virus probably brought by the aphid *Myzus persicae* from nearby virus-infected broccoli and cauliflowers.

317* SMITH, K. M.

“The Mosaic Disease of Sugar Beet and Related Plants.”

J. Minist. Agric. 1934, **41**, 269

A description is given of the symptoms of the sugar-beet mosaic disease. The insect vectors are shown to be the aphides *Myzus persicae* and *Aphis rumicis*. The latter seems to be the most important in the actual spread of the virus. An increase in the spread of the disease in the sugar beet fields seems to be correlated with the migrations of *Aphis rumicis* from the broad bean crops. An important source of mosaic infection is found to be in private gardens or wherever the biennial seakale beet or ‘perpetual’ spinach are grown. These plants afford an opportunity to the virus for overwintering.

366* SMITH, K. M.

“A New Virus Disease of Tomatoes.”

Nature. 1935, **135**, 908

The appearance of a new and serious virus disease is recorded and some of the chief characteristics of the disease are briefly described.

SMITH, K. M.

“Plant Viruses.”

Pp. ix + 107, with 11 Illustrations. Price 3/6 net. *Methuen's Biological Monographs*. London, 1935.

The aim of this small book is to present a clear statement of the general position and trend of plant virus research. It is mainly intended for the general botanist and entomologist and it is hoped to interest workers in allied branches of science in some of the problems of fundamental biological importance connected with the study of plant viruses.

365* SMITH, K. M.

“The Problem of a Plant Virus Infection.”

Nature. 1935, **136**, 395

The development of a virus disease in tobacco plants grown under what are usually considered to be virus-proof conditions is described. The virus can be detected in plants which previously have given a negative virus reaction. Three possibilities are discussed, firstly that the virus is present in the plant during the first negative test but present in undetectable form or quantity, secondly that the virus is arising spontaneously in the plant, and thirdly that the virus is spread about by some means unknown to plant virus workers.

374* SMITH, K. M.

“Some Diseases of Ornamental Plants Caused by the Virus of Tomato Spotted Wilt.”

J. R. Hort. Soc. 1934, **60**, 304

A description is given of some of the more important diseases caused by the virus of tomato spotted wilt on a number of ornamental plants.

- 371* SMITH, K. M.
"Two strains of Streak : a Virus Affecting the Tomato Plant."
Parasitology. 1935, **27**, 450
 Two strains of tomato streak virus 1 are described, it is shown that one strain will immunize a plant against the other strain. It has been found possible to separate the two strains out of a mixture by means of ultra-filtration through graded collodion membranes.
- 351* SMITH, K. M.
"A Virus Disease of Cultivated Crucifers."
Ann. Appl. Biol. 1935, **22**, 239
 An account of an apparently undescribed virus disease affecting Brassicas in the vicinity of Cambridge. The virus is capable of attacking a variety of Solanaceous plants and is transmitted by the aphid *Myzus persicae*.
- 370* SMITH, K. M.
"A Virus Disease of *Primula obconica* and Related Plants."
Ann. Appl. Biol. 1935, **22**, 236
 A description of a new disease caused in *Primula* species by the virus of cucumber mosaic.
- 355* SMITH, K. M. and BALD, J. G.
"A Description of a Necrotic Virus Disease Affecting Tobacco and other Plants."
Parasitology. 1935, **27**, 231
 An account is given of a virus disease which develops in tobacco plants when growing under insect proof conditions. Some physical properties of the virus are described and the particle size of the virus is measured by means of ultrafiltration and is calculated to be 20-30 millimicrons.
- 367* SMITH, K. M. and DUFRENOY, J.
"Sur le virus Y des Solanées."
C. R. Sci. Paris. 1934, **199**, 1147
 A study of some of the histological changes arising in tobacco plants affected with the Y virus.
- 353* SPOONER, E. T. C. and BAWDEN, F. C.
"Experiments on the Serological Reactions of the Potato Virus 'X'."
Brit. J. Exp. Path. 1935, **16**, 218
 A common antigen has been demonstrated in the saps of tobacco, *Nicotiana glutinosa*, *Datura stramonium* and the potato (vars. "President" and "Up-to-Date") infected with the potato virus "X."
 The antigen can be obtained in a stable and purified suspension by the method of precipitation by CO₂, which gives preparations of high infectivity.

The antigen flocculates and fixes complement with the sera of rabbits which have been treated with the sap of infected tobaccos, either crude or after purification with CO₂. It does not give these reactions with normal rabbit serum or the sera of rabbits treated with healthy tobacco sap.

Anti-viral sera in a dilution of 1/10 neutralize the infectivity of purified virus suspensions ; anti-healthy tobacco sera and normal rabbit serum do not.

Both anti-virus-sap sera and anti-healthy-sap sera contain small quantities of antibodies to normal tobacco antigens ; these antigens are not present in demonstrable amounts in preparations of the virus purified by CO₂ precipitation.

Healthy tobacco and healthy *Datura stramonium* leaves share a normal antigen.

The virus antigen is specific to the potato virus " X " and the closely related potato virus " D ". It was not demonstrated in the sap of tobaccos infected with the viruses of tobacco mosaic (Johnson's No. 1), tobacco ringspot or potato virus " Y."

The " X " virus antigen is closely associated with the infectivity of the virus. Collodion membranes which remove the one remove the other also. No antigenic differences were found between different strains of the " X " virus.

WESTON, W. A. R. DILLON.

" Clover Stem Rot."

Farming. Cambs Co. Coun. Bookl. 1935 (No. 4.), p. 11.

WESTON, W. A. R. DILLON.

" 'Fire' in Tulips."

Annu. Rep. Hort. Superint. Norfolk Co. Coun. 1934, p. 35.

WESTON, W. A. R. DILLON.

" Silver Leaf."

Annu. Rep. Hort. Superint. Norfolk Co. Coun. 1934, p. 38.

Horticulturist. 1935, **21** (No. 4), 4

PLANT PHYSIOLOGY.

348* BELL, G. D. H.

" Preliminary Experiments on Vernalization."

J. Agric. Sci. 1935, **25**, 245

The affect of exposing the soaked grain of some varieties of wheat, barley and oats, showed that the early growth stages of the treated plants are affected to varying degrees in the different varieties. The juvenile habit of the treated plants may be considerably affected, and examination of the growing points of treated and control plants showed a quicker growth and differentiation in primordial ear tissue in the treated plants.

Marked acceleration in earing in the vernalized plants was obtained in "winter" varieties, while very little or no acceleration was found in "spring" varieties. A greater acceleration was apparent when the plants were protected from low temperatures during early growth by growing in a glasshouse than when sowing was made at the same date in the field. It is suggested that this was due to the vernalizing effect of the field temperatures on the control plants, thus causing them to ear earlier than when grown in the glasshouse.

PARKER, W. H., SALAMAN, R. N. and BRANDRETH, B.

"Cooking Quality in Potatoes."

J. Nat. Inst. Agric. Bot. 1934, 3 (No. 4), 408

King Edward, Golden Wonder and Majestic were the varieties tested as grown on the following soils: Dunbar red sandstone, Oolitic limestone, medium heavy silt, black fen, and light sandy loam on sand. The tubers were tested by boiling and chipping respectively and marked for colour, consistency and flavour. Twenty samples of a single stock of Kerr's Pink were tested alongside and their variance used as a standard to measure the significance of variation between the results obtained from the cooking tests carried out on the 3 varieties. The following conclusions were reached:—

BOILED POTATOES.

For boiling, King Edward and Golden Wonder were better than Majestic, although the only single heading under which both excelled was that of colour, and here King Edward was better than Golden Wonder.

King Edward was inferior in consistency to both Majestic and Golden Wonder. When boiled there was no significant difference in flavour between varieties.

Soil affected quality for boiling as regards consistency only. It produced no difference in colour or flavour. Majestic gave the best consistency on heavy silt, and Golden Wonder on Dunbar red sandstone. King Edward seemed unaffected by soil.

CHIPPED POTATOES.

For chipping quality, Majestic and Golden Wonder were similar, although Majestic had the better flavour. King Edward was inferior under every heading.

Soil affected chipping quality chiefly in consistency and colour. The heavy silt was best, and black fen and oolitic limestone worst. As in the case of boiled potatoes, flavour was not affected by soil.

King Edward was best on heavy silt and Dunbar red sandstone, its superiority being due to colour and flavour respectively. The oolitic limestone was worst under every heading.

Majestic was not affected by soil as regards colour or flavour, but its consistency was better on heavy silt and Dunbar red sandstone than on sandy loam or oolitic limestone.

Golden Wonder was significantly better on heavy silt than on any other soil, although its flavour was equally good when grown on oolitic limestone.

The definite inferiority of the chipping quality of the samples grown on oolitic limestone is of much interest, since they were grown on what is reputed to be one of the best potato soils.

Examination of this anomaly demands further research.

SANDERS, H. G.

"Seed Treatment."

Trans. Yorks Agric. Soc. 1934, **92**, 27

A general account of the subject.

SOILS AND MANURES.

361* NICHOLSON, H. H.

"The Drainage Properties of Heavy Soils."

Trans. 3rd Int. Congr. Soil Sci. 1935, **1**, 385

A general account of field moisture conditions in heavy soils ; the processes of drying out in summer and re-wetting in winter ; the nature of the structure and profile and the persistence of the effects of extreme seasonal conditions, and tillage operations. The importance of deep tillages on drainage properties is stressed.

NICHOLSON, H. H.

"Land Drainage and the Farmer."

C.U. Agric. Soc. Mag. 1934, **4** (No. 2), 39

349* NICHOLSON, H. H.

"The Mode of Action of Mole Drains."

Fm and Mach. 1935, **2**, 61

Based on observations on mole drain systems in heavy gault clay, the way in which mole drains operate is described in terms of the structure and permeability profile of the soil, and the influence on these of cropping, tillages, and seasonal weathering effects. Various practical points in mole draining are illustrated and discussed.

322* NICHOLSON, H. H.

"The Rôle of Field Drains in Removing Excess Water from the Soil.

1. Some Observations on Rates of Flow from Outfalls."

J. Agric. Sci. 1934, **24**, 349

An examination of old records of tile drain performance, illustrating the differing behaviour of heavy- and light-soil types, and the connection between changes in water table level and drain efflux. Recent detailed records of outfall flows from a number of mole drain systems in heavy gault clay are described and discussed. The rapid and considerable variations in any heavy land drain outfall are stressed. The influence of cropping, tillages and seasonal weather changes on the drainage of heavy soils is illustrated.

341* NICHOLSON, H. H. and HANLEY, F.

"Soil Conditions in East Anglia."

Emp. J. Exp. Agric. 1935, **3**, 60

An account of the main types of soil encountered in the eastern counties, based on the more widespread geological deposits and outcrops, with data illustrating their composition, and descriptions of the characteristic agricultural practices in vogue on them.

RAYNS, F. and HANLEY, F.

"Notes on Manuring."

J. Minist. Agric. 1934, **41**, 1014

335* RUSSELL, J. L.

"Scientific Research in Soil Drainage."

J. Agric. Sci. 1934, **24**, 544

A survey of the literature on this subject. The chief points dealt with are (1) experimental drainage fields (2) methods of classifying soils for drainage, and (3) the effect of drainage on moisture conditions, physical properties of the soil, and crop yields.

STATISTICS.

368* WISHART, J.

"Analysis of Variance and Analysis of Covariance, their Meaning and their Application in Crop Experimentation."

Emp. Cott. Gr. Corp. 2nd. Conf. on Cotton Growing Problems. London, 1934, p. 83.

An account of the "randomized blocks" and "Latin Square" methods of field experimentation, with a description of the statistical technique involved, and a further account of the extension of the work that is sometimes possible by means of analysis of covariance where correlated variables are involved.

316* WISHART, J.

"Bibliography of Agricultural Statistics."

J. R. Stat. Soc. Suppl. 1934, **1**, 94

A collection of 157 titles of papers dealing with agricultural statistics and published during the years 1931-1933. The more important are provided with a short abstract of the contents.

315* WISHART, J.

"Statistics in Agricultural Research."

J. R. Stat. Soc. Suppl. 1934, **1**, 26

A summary account of the way in which statistical methods have been developed and applied in the particular domain of agricultural research. The main propositions leading to the necessary tests of significance are given, and the applications that have been made to field experimentation by means of analysis of variance and covariance are described. Other sections deal with the problem of sampling, and with the influence of meteorological factors on crop production.

MISCELLANEOUS.

HALNAN, E. T.

"Early Chronicles in the History of the Cambridge University Agricultural Society."

C.U. Agric. Soc. Mag. 1934, **4** (No. 2), 5

OXLEY, C. D.

"Notes on the Bacteriological Testing of Milk Samples."

Herts Co. Milk Rec. Soc. Rep., 1934, p. 58.

PUBLICATIONS.

Animal Nutrition Research Institute.

- 1st Report** on the East Anglian Pig Recording Scheme.
(Issued June, 1929)
- 2nd Report** on the East Anglian Pig Recording Scheme.
(Issued Oct. 1929)
- 3rd Report** on the East Anglian Pig Recording Scheme.
(Issued July, 1930)
- (These Reports have been discontinued).*

To be obtained from The Secretary, School of Agriculture, Cambridge, ENGLAND. Price 1s. each.

Cambridge University Agricultural Society Magazine (Issued

- Annually. 3 numbers comprising a volume).
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